

**CLAIMS**

WHAT IS CLAIMED IS:

1. A method of treating an ischemic region of a patient, the method comprising:  
positioning an ultrasonic transducer proximate to the ischemic region; and  
applying ultrasonic energy at a frequency at or above one megahertz (MHz) from  
said ultrasonic transducer to create a first thermal lesion in the ischemic region.
2. The method of Claim 1, wherein said ultrasonic energy is applied at a frequency  
between 4 MHz and 15 MHz.
3. The method of Claim 1, further comprising:  
repositioning said ultrasonic transducer; and  
applying ultrasonic energy at a frequency greater than approximately one megahertz from  
said ultrasonic transducer to create one or more second thermal lesions in the  
myocardium.
4. The method of Claim 3, wherein at least one second thermal lesion is created in  
the ischemic region adjacent said first thermal lesion.
5. The method of Claim 3, wherein at least one second thermal lesion is created in  
myocardium adjacent said ischemic region.
6. The method of Claim 5, wherein at least one second thermal lesion is created in  
the ischemic region of the myocardium adjacent said first thermal lesion.
7. The method of Claim 3, wherein said first thermal lesion and said one or more  
second thermal lesions are created so as to have a gradient of sizes.
8. The method of Claim 1, further comprising controlling the temperature of said  
transducer to be below approximately 80°C.
9. The method of Claim 8, wherein said ultrasonic transducer is connected to a  
power source having a controllable duty cycle, and said temperature of said ultrasonic transducer  
remains at or below 80° C by controlling said duty cycle.

1           10.    The method of Claim 1, wherein said ultrasonic transducer is one of an array of  
2 ultrasonic transducers, said method further comprises:

3                   applying ultrasonic energy at a frequency greater than approximately one  
4 megahertz from the one or more ultrasonic transducer in said array of ultrasonic  
5 transducers to create one or more second thermal lesions in said myocardium.

1           11.    The method of Claim 1, wherein said ultrasonic energy is applied so that said first  
2 thermal lesion is located internal to the myocardium and distal from an endocardium and an  
3 epicardium of said myocardium.

1           12.    The method of Claim 11, further comprising applying ultrasonic energy at a  
2 frequency greater than approximately one megahertz from said ultrasonic transducer to create  
3 one or more second thermal lesions located internal to the myocardium and distal from the  
4 endocardium and epicardium.

1           13.    The method of Claim 1, wherein said ultrasonic transducer is inserted inside a  
2 heart of the patient.

1           14.    An apparatus for creating multiple thermal lesions in biological tissue, the  
2 apparatus comprising:  
3                   a catheter;  
4                   an array of ultrasonic transducers mounted on a distal portion of said catheter;  
5                   a power source that provides energy through said catheter to said ultrasonic  
6 transducers; and  
7                   a controller for controlling the energy provided to said ultrasonic transducers from  
8 said power source.

1           15.    The apparatus of Claim 14, wherein the ultrasonic transducers of the array are  
2 each independently coupled to said power source and independently controlled by said  
3 controller.

1           16.    An apparatus for creating thermal lesions within biological tissue, the apparatus  
2 comprising:  
3                   a catheter;

4 an ultrasonic transducer mounted on a distal end of said catheter, said ultrasonic  
5 transducer having a shape that causes ultrasonic energy emanating from said transducer  
6 to converge on a region beyond said transducer;

7 a power source that provides energy through said catheter to said ultrasonic  
8 transducer; and

9 a controller for controlling the energy provided to said ultrasonic transducer from  
10 said power source.

1 17. The apparatus of Claim 16, wherein said shape is a partial cylinder, is bowl-like,  
2 or is hyperboloid-like.

1 18. The apparatus of Claim 16, further comprising one or more additional ultrasonic  
2 transducers mounted on said distal end of said catheter.

1 19. The apparatus of Claim 18, wherein said additional transducers have a shape that  
2 causes ultrasonic energy emanating from said additional transducers to converge in a region  
3 beyond said transducer.

4 20. The apparatus of Claim 18, wherein one or more of said ultrasonic transducers are  
5 independently coupled to said power source and independently controlled by said controller.